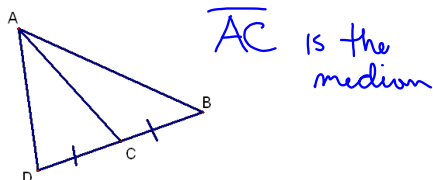
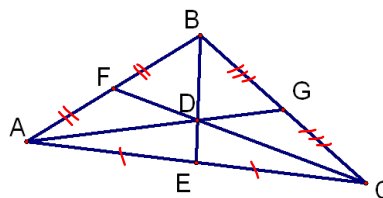


5.4 Use Medians and Altitudes

Median—is a segment whose endpoints are the vertex of a triangle and the midpoint of the side opposite the vertex.

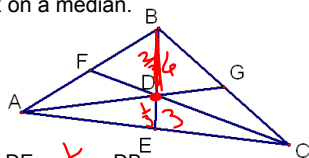


Centroid—The point of concurrency of the three medians of a triangle.



Thm 5.8 The Centroid Theorem—The centroid of a triangle is located two-thirds of the distance from a vertex to the midpoint of the side opposite the vertex on a median.

Conclusion:



$$DB = \frac{2}{3} BE \quad DE = \frac{1}{3} BE \quad DE = \frac{1}{2} DB$$

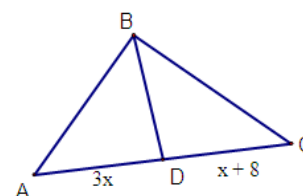
$$DA = \frac{2}{3} AG \quad DG = \frac{1}{3} AG \quad DG = \frac{1}{2} AD$$

$$CD = \frac{2}{3} CF \quad FD = \frac{1}{3} CF \quad FD = \frac{1}{2} CD$$

Examples:

1. \overline{BD} is a median in $\triangle ABC$. Solve for x .

$$\begin{aligned} 3x &= x + 8 \\ 2x &= 8 \\ x &= 4 \end{aligned}$$



2. G is the centroid.

$$AG = 7.4$$

$$AD = 6a$$

$$a = 1.85$$

$$GE = 5c$$

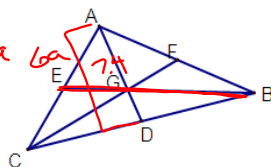
$$EB = 22.8$$

$$c = 1.52$$

$$7.4 = \frac{2}{3}6a$$

$$7.4 = 4a$$

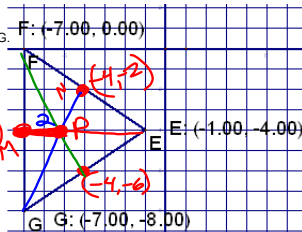
$$5c = \frac{1}{3}22.8$$



3. Find the midpoints of the three sides of $\triangle FEG$.

Sketch the medians. Label the centroid P.

What are the coordinates for P?



$$\text{Find } EM = 6$$

$$\frac{1}{3}6 = 2 \text{ units from M}$$

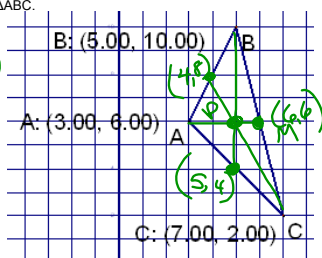
4. Find the midpoints of the three sides of $\triangle ABC$.

Sketch the medians. Label the centroid P.

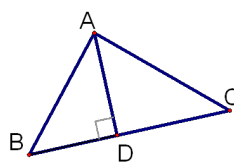
What are the coordinates for P?

$$AM = 3$$

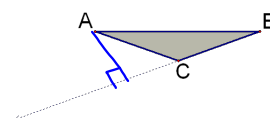
$$\frac{2}{3}3 = 2 \text{ units from A}$$



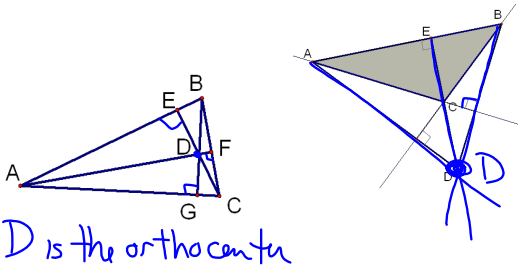
Altitude—of a triangle is a perpendicular segment from a vertex to the line containing the opposite side.



The altitude from A to \overline{BC} is on the outside of this triangle.



Orthocenter—is the point of concurrency of the three altitudes of a triangle.

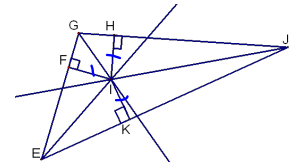
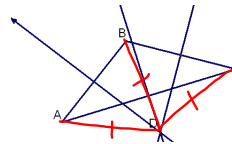


Summary

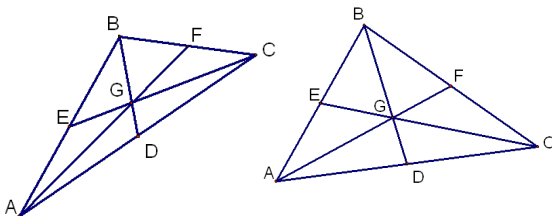
The circumcenter.

(3 ⊥ bis.)
 $\overline{DA} \cong \overline{DB} \cong \overline{DC}$

The incenter. (3 < bis.)
 $\overline{IK} \cong \overline{IF} \cong \overline{IH}$



The Centroid (3 medians)
 $BG = \frac{2}{3}BD$ $GL = \frac{2}{3}EC$ $AG = \frac{2}{3}AF$
 $GD = \frac{1}{3}BD$ $EG = \frac{1}{3}EC$ $GF = \frac{1}{3}AF$
 $GD = \frac{1}{2}BG$ $EG = \frac{1}{2}GC$ $GF = \frac{1}{2}AG$



Challenge: Find the coordinates of the centroid of triangle ABC
 $A(5, 4)$ $B(1, -2)$ $C(-4, 0)$

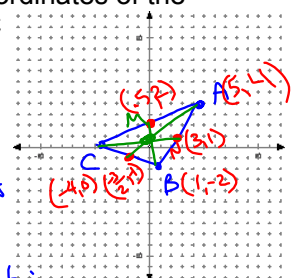
Find the eqn's of
 2 of the medians (lines)

Find their intersection

MB
 $m = \frac{2 - -2}{\frac{1}{2} - 1} = -8$ $y = -8x + b$
 $-2 = -8(1) + b$
 $6 = b$

$y = -8x + 6$
 $y = \frac{1}{7}x + \frac{4}{7}$

$7[-8x + 6 = \frac{1}{7}x + \frac{4}{7}]$
 $-56x + 42 = x + 4$
 $-57x = -38$
 $x = \frac{38}{57}$



CN
 $m = \frac{1 - 0}{3 - -4} = \frac{1}{7}$
 $y = \frac{1}{7}x + b$
 $1 = \frac{1}{7}(3) + b$
 $\frac{4}{7} = b$

$(\frac{2}{3}, \frac{2}{3})$

HW
p322-323
#s 17-22, 25-27, 33, 35